A WAVE OF DARKNESS.

At Pittsburg, Pa., between 10 and 11 a. m., November 9, during a storm of rain and wind a period of great darkness occurred. The shade came up the Ohio Valley from the northwest like the shadow of an eclipse. It seemed to be produced by an area of low sweeping clouds broad enough to cover the heavens and dense enough to cut off all light from above. Business was suspended and the streets were filled with people looking upward anxiously. When the darkness was at its height the sudden dawning of a spot of silver brightness, low down on the horizon, over the Ohio brought relief. This was the rear guard of the darkness and beneath the bright spot its reflection in the river appeared like molten silver. Three such waves of darkness and light are said to have occurred successively, each one taking but a few minutes to pass.

[NOTE.—The weather map of November 9 shows that a cold wave was at this time about to pass over western Pennsylvania, and that the advancing front of a belt of cloud and rain was at this time a little to the northwest of Pittsburg and moving southward. Such a belt is usually marked by a series of several long parallel clouds, representing either the crests of great atmospheric waves or the tops of great atmospheric breakers, similar to those of the ocean surf or to the tidal bore that advances up the coast of converging inlets and river deltas. The observer at Pittsburg seems to have caught a series of observations beneath these successive wave clouds as they rolled over the city of Pittsburg. The depth or thickness of such a cloud is approximately indicated by the darkness beneath it and as the heaviest thunder clouds, hail clouds, and tornado clouds produce similar degrees of darkness it is fair to presume that the clouds at Pittsburg were as deep as those. The local topography greatly affects the style, the thickness, and the motion of the clouds, and it may be rare to observe three such clouds as occured at Pittsburg in succession, but it is a very common phenomenon to notice the great darkness that occurs whenever any heavy cloud, especially those with hail and rain pass over a station. Several similar waves but much thinner and at much greater distances apart are commonly observed at Washington whenever a northwest wind breaks over the Appalachian Mountains, and runs under the air of the Atlantic Slope. The distance apart of such crests in time and in miles should be determined whenever possible.]

LONG-RANGE FORECASTS IN OREGON.

The following extract from the weather synopsis and general forecast by Mr. B. S. Pague, Local Forecast Official at Portland, Oreg., was published on his morning weather map for November 12, 1895.

The first winter storm of the season is shown on the map this morning. The conditions, as shown, are those peculiar to the winter season and represent the passage of the dry season and the appearance of the wet season. On April 20 last, the first type of summer, dry conditions appeared. It was then stated that from this date, April 20, the rain would be light and of a local, more than a general, nature. The conditions from April 20 to date show how well the remarks then made were verified. The phenomenal dry season, which has prevailed over the Pacific northwest for the past six weeks, was due to the storm areas passing from the north, east of the Rocky Mountains, to the southeast toward the Great Lakes; usually, the storm areas have this movement during the months from June to the middle of September, when they assume their winter course, and move southward along the coast line striking land about Vancouver Island, then moving eastward, or at times move in other directions. The period of dry weather is now over; it is probable that short periods of fair weather may prevail, but it is not probable that any extended period of fair weather will again prevail until next spring. Since April 20th last the conditions were more in favor of dry weather than of wet weather, from now on the reverse of this will be true.

The precipitation over the Pacific northwest, since January 1, has been about 30 per cent deficient, and it is reasonable to assume that for the remainder of the year there will be an excess.

[NOTE.—The importance of long-range predictions, especially when based upon a broad study of atmospheric conditions over the whole globe, cannot be overestimated. The changes in the course of storm tracks may be spoken of as either the cause or the concomitant of changes in the weather and climate. In a narrow sense they are the cause, but in a broader sense they may often be considered as simply accompanying or correlated phenomena. The weather on the immediate coast of Oregon and Washington depends so largely upon what is called the general circulation of the atmosphere over the North and South Pacific oceans that it may be reasonably hoped that the study of this latter subject will elucidate the matter and render these seasonal forecasts highly accurate and satisfactory.]

OBSERVATIONS AT HONOLULU.

Meteorological observations at Honolulu, Republic of Hawaii, by Curtis J. Lyons, Meteorologist to the Government Survey.

Pressure is corrected for temperature and reduced to sea level, but the gravity correction, —0.06, is still to be applied.

The absolute humidity is expressed in grains of water, per cubic foot, and is the average of four observations daily.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 10.

The rainfall for twenty-four hours is given as measured at 6 a. m. on the respective dates.

October, 1895.	Pressure at sea level.			Temperature.					Humidity.			Wind.		Cloudiness.	Rain measured at 6 a. m.
									Relative.						
	9 a. m.	3 p. m.	9 p. m.	6 a. m.	2 p. m.	9 p. m.	Maximum.	Minimum.	9 a. m.	9 p. m.	Absolute.	Direction.	Force.		
	Ins.	Ins.	Ins.	°	°	°	°	°	%	%					Ins.
1 ..	30.02	29.93	30.01	70	82	73	83	70	68	81	7.2	ne.	2	2	0.00
2 ..	30.04	30.00	30.08	73	82	74	84	71	64	85	7.8	e-s-n.	1	3	0.00
3 ..	30.09	30.01	30.07	73	84	78	84	72	75	71	8.0	ene.	2	4	0.09
4 ..	30.04	29.93	30.02	74	82	76	84	70	64	70	7.1	nne.	4-1	2	0.00
5 ..	30.01	29.94	30.02	69	81	76	83	68	63	70	7.0	ne.	2	3	0.00
6 ..	30.05	29.97	30.06	73	82	74	83	71	64	78	7.0	ne-n.	2	2	0.00
7 ..	30.08	30.01	30.06	75	81	74	82	71	69	80	7.2	nne.	3	4	0.00
8 ..	30.00	30.00	30.07	75	81	76	83	73	66	70	6.9	ne.	3	4	0.07
9 ..	30.05	29.97	30.05	74	80	77	83	72	64	65	6.7	ne.	4	3	0.04
10 ..	30.04	29.97	30.04	75	82	75	82	73	67	70	6.9	ene.	3	4	0.01
11 ..	30.05	29.96	30.02	75	82	76	83	75	61	66	6.3	ne.	3	1	0.03
12 ..	29.98	29.89	29.94	67	79	70	80	66	64	80	6.8	n-s-e.	2	7	0.13
13 ..	29.90	29.80	29.90	66	80	72	81	66	70	80	7.0	w-s	2	0-3	0.06
14 ..	29.94	29.87	29.95	70	81	72	83	67	70	80	7.0	n.	1	0-3	0.00
15 ..	30.00	29.92	29.99	68	82	77	83	66	68	72	7.0	ne.	3	1	0.00
16 ..	30.02	29.93	30.02	70	86	78	87	70	75	79	8.2	n-s.	1	3-6	0.00
17 ..	30.02	29.97	30.04	73	83	75	86	72	75	89	8.4	s.	2	3-7	0.00
18 ..	30.04	29.95	30.00	73	82	78	86	73	70	75	7.9	n.	3	8	0.03
19 ..	30.00	29.92	29.97	72	83	75	86	71	72	86	8.1	s.	2	4	0.01
20 ..	29.97	29.90	29.97	74	84	75	85	71	72	81	7.9	s.	2	10-3	0.00
21 ..	29.94	29.87	29.93	71	82	73	85	71	75	85	7.7	s.	2	8-4	0.00
22 ..	29.94	30.90	29.98	72	79	72	85	71	75	90	8.1	s.	1	1-6	0.00
23 ..	30.03	29.96	30.05	68	84	73	86	68	75	85	7.8	e-s.	1	3	0.27
24 ..	30.08	30.00	30.05	75	82	78	84	70	68	73	7.7	nne.	3	4	0.00
25 ..	30.06	29.95	30.02	75	79	77	82	74	75	77	8.0	nne.	3	5	0.00
26 ..	29.98	29.89	29.98	75	81	77	83	73	78	76	7.8	ene.	3	3	0.20
27 ..	30.02	29.93	30.01	70	81	77	82	70	72	76	7.8	ne.	1-3	4-2	0.15
28 ..	30.06	29.96	30.03	72	80	75	82	72	85	70	7.6	nne.	4	8-2	0.16
29 ..	30.06	30.00	30.08	73	78	77	82	69	73	71	7.4	nne.	3	7	0.05
30 ..	30.09	30.01	30.06	73	81	77	83	73	69	71	7.1	ne.	4	3	0.07
31 ..	30.08	29.99	30.07	76	81	77	83	76	60	75	6.9	ne.	3-5	5	0.01
	30.01	29.94	30.02	72.2	81.5	75.3	83.5	70.8	69.1	76.7	7.4	....	......	......	1.38

The monthly summary for October is: Mean temperature, 6+2+9 ÷ 3 was 76.3; the normal is 76.5; extreme temperatures, 87° and 66°.
Relative humidity 3 per cent above normal.

DO THUNDERSTORMS MOVE AGAINST THE WIND?

In a letter of February 10, 1896, Mr. G. W. Richards, Voluntary Observer, Maple Plain, Minn., says:

From my observations of several years in this section, I find that our heaviest storms move from the southwest, west-southwest or west, and are accompanied, or at least preceded, by surface winds ranging from southeast, east or northeast, and that there is a greater likelihood of a storm passing over this region if the wind direction makes an angle of from 135° to 180° with the direction of motion of the rain cloud than if it makes an angle of only 90° or quarter-wise. With the wind from the south, or quarter-wise, there seems to be a greater tendency of the showers to pass around to the northward. It seems that with east winds and with showers advancing from the west or southwest we are more in the line of the showers' path than if the wind were coming from a more southerly direction. If the shower is of great intensity it frequently happens that the east wind will subside about the time when the storm reaches here and there will be quite a blow outward from the storm. This will soon be over, and then the wind becomes again easterly before the shower is over, and quite likely there will be a further series of showers. The same may be said of our winter snowstorms. Most of these move with the surface wind blowing at an angle of 135° to 180° with the movement of the cirrus, the cirro-stratus, and the attendant pallium haze. Our heaviest snowstorms move from the southwest attended by east to southeast winds.

PENETRATION OF SNOW BY BULLETS.

According to the French journal Cosmos, Vol. XXX, p. 386—

The officers of the 439th regiment of French infantry, in garrison at Aurillac, made some experiments in February, 1895, on thee ffect of shooting rifle balls into the snow from the Lebel rifle, and arrived at some very unexpected results. Heaps of snow varying in depths of from 1 to 2 meters were raised on the shooting grounds at Ombrado and Buis, near Aurillac, and the soldiers fired into them from a distance of 50 meters (164 feet). The Lebel ball only penetrated to a depth of 1.75 meters (5.7 feet). The cause of this phenomenon has not, as yet, been discovered. It is suggested, however, that by reason of its great velocity and rotation the ball attracts to itself an increasing mass of ice that finally destroys its power of penetration.

The above paragraph suggests an exceedingly interesting subject for careful experimental investigation. Will solid ice act as effectually as snow in stopping a rifle ball? Does hard packed snow resist the ball better than light drifted snow? Does the ball really gather about itself a large mass of snow-ice, or is the accumulation mostly in the rear and following after the ball?

ANCIENT CLIMATES NEAR CHICAGO.

The discovery of clearly-defined ancient lake beaches and layers of driftwood long since buried under the sand at the southern end of Lake Michigan has led Mr. Ossian Guthrie to compile a short account of this subject, from which we make the following brief extracts:

Nearly parallel with the shores of Lake Michigan and from half to three-fourths of a mile to the west of it is the beach of an ancient lake sloping to the west. The surface of this lake was about 12 feet above the present level of Lake Michigan, and on its eastern shore are buried the trunks and fragments of an ancient forest. * * * In 1871 the trunk of an immense white oak tree was found at the bottom of a trench when excavating for the main sewer in Michigan avenue south of Thirty-fourth street. In 1881 the trunk of an oak tree was found several feet below the ground at the corner of Lincoln and Belden avenues. In the same year the trunk of a white oak, stripped of its branches, without root or stump, 60 feet long and 2 feet in diameter, was found while excavating for a sewer in Forty-eighth street near Prairie avenue. In 1885, at the corner of Thirty-fourth street and Indiana avenue, the trunk of a large white oak was found, the under side of which had been flattened and cut away almost to the center, but there was no evidence of the work of man. In 1888, and near the location of the find of 1871, Mr. Guthrie discovered the bed of an ancient lake, completely covered with driftwood. During 1895, at Thirty-ninth street and Forest avenue, a large white oak trunk was found 11 feet below the surface. At Thirty-eighth street and Indiana avenue, 8 feet below the surface, a space 110 feet by 160 was completely excavated, and the general slope of the beach of the ancient lake could be determined; but below this first beach there was found an older beach, and it is possible that others are still below that.

During the Glacial epoch the basin of Lake Michigan was filled and covered to a great depth with ice in the form that constitutes a glacier. When the ice melted away at the southern end of the lake the glacier was still firm enough to choke up the north end of Lake Michigan, and the melted water constituted a lake whose level was probably 50 feet above the present level, as is proven by the remnants of the old beach line still to be found in various parts of the country. The many varieties of wood—elm, willow, white oak, butternut, and black walnut—are found here in promiscuous confusion, seeming to preclude the possibility that they grew where they are buried. The flattened and sand-rubbed surfaces of some of these trunks show that they have been drifting about and dragging and rubbing their sunken portions upon the sandy bed of the ancient lake.

During the Glacial period the Des Plaines River was entirely tributary to the Mississippi River, but at the close of the period it was entirely tributary to Lake Michigan. After awhile a sandbar was formed, by reason of which the Des Plaines became again tributary to the Mississippi; but subsequently the bar was broken through, and it flowed into Lake Michigan through the new channel, or what is now the south branch. Finally came the present condition, in which the river is mainly tributary to the Mississippi. All these changes have been the result of the action of ice and water, rain and wind. The heavy north winds built the 5 miles of sandy plains in the Calumet region, by reason of which the southern end of the great inland lake was filled in. If these processes at the south end of Lake Michigan be traced back to their connection with the changes going on at Niagara Falls, they give us six or eight thousand years as the approximate interval that must have elapsed since the disappearance of the Glacial ice in Lake Michigan. We infer that at that time the climate was not so greatly different from that which now prevails and that the same varieties of timber that are growing now could also flourish then.

STORM WAVE AT SAUSALITO.

On Monday, November 11, the automatic tide gauge maintained by the U. S. Coast and Geodetic Survey at Sausalito, near San Francisco, recorded an unusual series of rapid fluctuations. These began about 8.20 a. m., and continued for eighteen hours, or until 2 a. m. of Tuesday, without intermission, but with a slight diminution of intensity. This disturbance was apparently not due to an earthquake at some distant point in the Pacific Ocean, although such are frequently recorded on the gauge. Neither could it have been caused by a storm of short duration but great intensity, such as that which had a short time before passed over La Paz in Lower California. The present disturbance, consisting of about twenty-five large fluctuations, was in all probability due to some one of the greater hurricanes that last for many days. Such storms as they move onward continue growing up to a maximum stage of development, after which they break up or die away. The whole region of the ocean over which they pass is lashed by the winds into a terrible sea, whose waves, spreading out in all directions, are easily recorded on such gauges as that at Sausalito. It has been suggested that we have here a record of waves emanating from the hurricane encountered during the 15th, 16th, and 17th, by the steamship *Tacoma*, which left Yokohama on the 10th and arrived at Victoria, B. C., on the 27th. But that hurricane, which was southeast of Kamschatka on the 15–17th, must have been much nearer Japan and of much smaller extent on the 10th. Its track on this latter date was probably at a distance of about 70° or 75° of a great circle, or perhaps 5,000 statute miles west of San Francisco, and its waves would require twelve hours or more to reach Sausalito.

In the MONTHLY WEATHER REVIEW for May, 1877, pages 9 and 10, the present editor gave some data for determining the average velocity of very large waves across the Pacific Ocean, from which it appeared that the first great wave moved from an earthquake center on the coast of Peru to Honolulu, or through 96° of the great circle in fourteen hours, and therefore at the average hourly speed of 6.8°. This was much larger than the speed when passing over shallower portions along the coast of the Pacific. It was also larger than the speed of the succeeding waves, and especially of the maximum wave, which fact simply shows that the first waves, moving with greater speed, flattened out, and perhaps even disappeared, while the slower speed of the maximum wave was really the speed of a group of waves. When a group of waves runs along in smooth water under a calm the individual waves can be seen to be always, as it were, running forward through the group and dying out in front so that in deep water the speed of the group, as a whole, is about one-half that of its individual components, but in shallow water they may equal each other. In strong storm winds the same rule holds good. The average measured speed of large storm waves is given as follows at page 28 of the Navigator's Handbook for the Indian Ocean, published in German in 1892 by the Seewarte at Hamburg:

In the region of the trade winds the average length of the waves of the Indian Ocean is 96 meters (315 feet); the periodic time, 7.6 seconds; the rate of advance of the crest, 12.6 meters per second (28.2 miles per hour).

In the region of the strong west winds in the southerly part of the South Indian Ocean the average length of the waves is 114 meters (374 feet), the periodic time is 15.0 seconds, the rate of advance of the crest is 15.0 meters per second, or 33.6 miles per hour.